DATA PROCESSING DIGEST

A SERVICE OF CANNING SISSON AND ASSOCIATES

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General Information

"What Management Should Know about Electronics for the Office"

MANAGEMENT METHODS, January, 1955

Six facts are presented to describe the present and future status of business electronics:

"1- You can reasonably assume a three-year target date for getting into electronic operation if you start from scratch today.

"2- Virtually any firm employing more then 100 clerical workers is ripe for some form of electronic data processing.

"3- The price of electronic data processing equipment is consistent with its ability to provide a proper rate of return.

"4- Lower priced, special purpose machines are already in actual use by private firms. Newer equipment is coming out fast.

"5- The fear of obsolescence of present-day equipment is no excuse for failure by management to act.

"6- Human beings are going to be displaced in staggering numbers by electronic equipment. Productivity will soar as white-collar employment and purchasing power drops. This economic imbalance must be anticipated. It isn't realistic to say that we have gone through one 'Industrial Revolution' and, after a period of readjustment, were able to improve the standard of living of all people. *The effect of electronic equipment on our economic life is of the same magnitude as the effect of the H-bomb on our military strategy.*"

Beginning with this issue (page 13) we present a series of articles on the objectives, problems, and techniques of business data processing systems. This is in answer to a number of requests from persons who have recently become interested in the field. It is hoped this series will prove of interest and educational value to those unfamiliar with the field; and that the articles will provide a review for those who have been in the field for some time.

Part III – "Economic Appraisal of the Project." *

The C. & O. decided that a quick study of the possibility of installing an electronic computer system would give adequate estimates of advantages over present methods.

Method evaluation was as follows: Instead of synthesizing a new system, the C. & O. analyzed their present system. Each function was examined in the light of its adaptability to the computer's ability to perform various types of logical decision. Further study was made to seek out those functions and operations which could not be mechanized before, but which could be handled by the computer. Then an overall study was made to evaluate the economics of a computer installation.

Although the first area for computer application is in accounting, procedures are being designed to be flexible for later integration in the entire system. Additional information, never before possible to obtain, will be available as a by-product of the new accounting application.

PART IV – "Strengthened Management Control."

This report starts out with an interesting statement of policy: "Strengthening management control is largely a matter of improving the elements of an information handling system. We feel that we are planning toward this end by exploiting the merger of a modern communication system with the ability of a computer to digest and analyze volumes of data quickly enough for management usage in decision making."

The elements of an information system aimed at management control, using the one-shot system are:

1- Data gathering. The one-shot philosophy reduces cost by making multi-purpose use of data.

2- Data transmission. A communications system compatible with machine language.

3- Data processing. Use of computer to produce information to compare results with management goals.

4- Data presentation. Information presented quickly, in a variety of forms for management.

5- Final evaluation. Management skills are called upon in the final step, to make the right decisions based upon the computer-processed facts.

Several examples are given in this paper to show how the one-shot system applies. One of these examples is in the area of Traffic Handled, the problem of freight car allocation.

Considering the freight car as inventory, and "turnaround" as turnover, the problem becomes similar to a distribution or manufacturing problem. The one-shot system is expected to provide 1) accurate reporting, 2) means for predicting availability of empty cars, 3) ability to expand present limits of geographic area of control.

Another aspect of the strengthening of management controls by the one-shot system is the tendency toward the practice of "management by exception." The reasoning is:

1- The first step in developing a one-shot system is a study of its output requirements as demanded by management.

2- Goals or standards will be demanded in areas where they do not now exist.

3- Existing goals or standards will be subjected to mathematic testing for validity.

4- The presence of mathematicians in the study will force management to do some scientific evaluation of the existing process.

The computer will process actual results against standards to detect exceptions for management evaluation.

The one-shot philosophy will free sales and operating management from the "preliminary aspects of decision-making, thus affording them more time and opportunity to exercise higher level management skills."

*See May, 1955 issue of DPD, pages 5 and 6, for Parts I and II.

"Computers in Industrial Research," *by R. F. Clippinger, B. Dimsdale, and J. H. Levin.*

JOURNAL OF THE SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS; Part I, September, 1953, pages 1-15; Part II, December, 1953, pages 91-110; Part III, March, 1954, pages 36-56; Part IV, June, 1954, pages 113-131.

The series of articles is an appraisal of the effect of electronic computer development on industrial research and data handling and control. A discussion of general purpose computers points out the importance of the computer staff and stresses that people of the greatest possible competence should be obtained; in fact, even more attention should be paid to proper staffing than to proper choice of computer.

Most of the problems in industrial research can be classified in either of two basic types: 1) given a certain physical set-up, determine its behavior; and 2) what physical set-up will best accomplish certain goals? Thus, mathematicians can reduce problems of widely differing nature, many of which have been insolvable, to these two basic types, and prepare them for automatic processing, drastically reducing the time and cost of computing.

Section II describes in detail a typical problem in which an optical system is to be designed with certain prescribed properties. The problem is one of determining the number, shapes, and positions of optical elements required to focus the light from a given region. The conclusion drawn is that cost of preparing a problem for computing by automatic means must be justified by the complexity and importance of the problem, and by other criteria such as economy of time.

Section III describes some of the features to be looked for in buying or renting electronic computing equipment. A careful study of requirements and available equipment is advised. The size and quality of the programming, coding, and maintenance staff is of primary importance, and the cost may greatly exceed that of the equipment. Four alternatives in using automatic computing methods are suggested: 1) purchasing a computer, 2) renting a computer, 3) renting time on some one else's computer, 4) making use of a computing service.

Part IV describes the types of problems which can be solved by a digital computer. Problems range from those which have tremendous quantities of data entering or leaving, but relatively little internal operation on the data, to those which have few inputs and outputs but much internal computing. The latter type would require that the computer have a large internal memory and high manipulation rates.

Examples of the first type of problem are payroll accounting, labor distribution, material distribution, accounts receivable, and accounts payable. Other examples are magazine and book club subscription lists, insurance policy lists, mail order and department stores, and transportation. Production and personnel scheduling also come under this type of high quantity input - low quantity computing problem.

The type of problems which require a great deal of computing, hence large internal memory, includes testing and control (such as aero dynamic tests in wind tunnel), flight tests, instrumentation (such as for use in automatic factories), and interpolations.

There is another classification of problems in which quantities of data require a great deal of computing. This includes operations research problems in such fields as water management, production scheduling, transportation; and in the field of statistics: quality control, correlation, prediction.

The solving of linear equations and differential equations are still other areas in which the digital computer is of value.

All of the problems are classified in detail according to the ratio of data handling operations to computing operations. The following statement is of particular interest:

"It is important in problems of the data handling type that the preliminary survey take a macroscopic view of the entire operation, rather than attempt to estimate what is involved in reproducing each existing operation. For example, the entire accounting procedure of a business may have to undergo drastic revision and streamlining before the introduction of digital techniques will show any savings. And in many cases, the savings which may appear to result from the introduction of such methods may have really resulted in large part from the re-evaluation and overhaul which was a prerequisite to digital equipment."

Parts V and VI will be abstracted in later issues.

"Proceedings of the First Conference on Training Personnel for the Computing Machine Field," held at Wayne University, June 22, 23, 1954. *Edited by Arvid W. Jacobson.* *WAYNE UNIVERSITY PRESS, 1955.*

Purpose of Conference: "To find out about manpower requirements in all areas relating to automatic computing and data processing. To examine the training programs offered by educational institutions, government installations, and computer supplers. To inquire into the relationships of computer education and the established curriculum, into the influence of these new concepts and methods on the accepted educational procedures and policies as well as on the classical methodology of science. Finally, to forge cooperation among industry, education, and government."

Present and projected manpower needs in business and industry--M. E. Mengel, Burroughs Corporation.

In a survey of 139 manufacturing companies, the answers to a questionnaire about the use of computers and manpower requirements led to some general conclusions, based not on accurate figures, but on apparent trends.

About one out of five companies (according to the survey) uses electronic computing equipment, and about 5% of the computing time is devoted to business applications. However, looking toward the day when computers on order are operating, this percentage rises to 16%. Engineering and scientific use account for the remaining time. Most of the applications reported were in the area of business management. Only a few were using computers for payroll, invoicing, etc. Based on answers by present users of electronic equipment as to the types of manpower needed, the survey showed that 43% of the personnel should be analysts, and that mathematical analysis and understanding of the jobs to be performed were the most necessary skills. Most companies considered it more important to have the math training, and to receive computer training as auxiliary training, either by the company or by the computer manufacturer. About half of the companies found it necessary to train their own personnel. Manufacturers preferred, however, that the training be done by colleges and universities.

Status of university educational programs relative to high speed computation--H. D. Huskey, University of California.

A survey of undergraduate university courses in mathematical analysis and other computer-related subjects revealed two patterns: 1) some universities have established computing centers and around these a complex of courses on various aspects of automatic computation; 2) some universities have established introductory courses with the view toward gradually augmenting their computing facilities. At the present time about 30 universities in the U.S. have regular computer courses (analog and digital). Most of the training is done in electrical engineering departments; mathematics departments are second, with courses in logical design, programming, applications.

Graduate instruction and research--K. E. Iverson, Harvard University

Too little attention has been given to the setting up of graduate courses in data processing, but Harvard has designed a master's degree program which may become a model for such courses. The program covers a year of study and was designed under the combined efforts of the Division of Applied Science, Department of Economics, and Graduate School of Business Administration. Courses include study in data processing, electronic control and calculating circuits, accounting, operations research, machine components, statistics. The new program is oriented toward business applications.

Other talks and panels, included in the Proceedings, concerned the role of the government in computer education, the influence of computers on education in general, cooperative efforts for training and research.

Applications

"Integrated data processing comes to life"

AUTOMATION, May, 1955; pages 59-65

Here is an example of the use of common language tape and available equipment to carry on an integrated data processing system for handling customers' orders.

The Aluminum Company of America processes orders so that they pass through the central production planning functions in Pittsburgh and are in the designated plant ready for manufacture to begin within less than 24 hours from entry in a local sales office.

Alcoa has 60 sales offices from coast to coast and 24 different plants throughout the country. As many as 1000 orders might be handled through this network in a single day.

The system depends upon a private teletype network of over 20,000 miles. Pittsburgh forms the hub of the system. Five-channel tape is the common medium for operating and integrating electric typewriters, tabulating-card punches, teletypewriters. Other equipment can be tied in later on.

Standard Register Company assisted in setting up the system by designing simplified forms.

The system works on the principle that basic information should be initially written down in a form that thereafter makes manual copying and checking unnecessary.

Sales offices are equipped with Flexowriters, and with teletype machines which are connected by wire to the production planning division in Pittsburgh. The Alcoa plants are also connected with Pittsburgh via teletype.

When an order is received from a customer, a form is filled in using only that information which is unique to the order (such as shipping date). The information which is repetitive for this customer or the material requested is filed on punched tapes. A combination of manual typing and tape reading by the Flexowriter prepares a typed sales order and a punched tape. When this proof copy is completed and corrected, the tape is used to transmit the order by teletype to Pittsburgh.

The teletypewriters in the production planning division produce a tape and a four-part set of the sales order. A serial number is assigned to the tape and its related typed copies. The tape is coiled and filed by number. The fourth copy is retained in the teletype room by sales office to check against each sales office's end-of-day count. The other copies are delivered to the production planner who allots the orders promptly and marks the plant from which material is to be shipped on the three copies of each sales order. He retains the production planning copy, and forwards the other two to the tabulating section (which gets from it punch-card data to be used in other departments) and to the teletype room. This latter copy is now used to prepare a line-up for transmission of this and other orders to the proper plant, and to identify the tape by file number. Transmission to the plants takes place in the late afternoon and evening. The "ship from" point is added in transmission by means of a separate and permanently filed piece of tape, which precedes the order tape, and which contains the complete name and location of the plant. Simultaneously, the teletypewriter prepares copies of the sales orders in a five-part set for the Pittsburgh office.

The plant receives the sales order on a four-part form along with a simultaneous punched tape. The four copies are routed thus:

1- A reproducible copy used to make additional copies for the mill office and planners and through use of blackouts, imprint a variety of other forms.

2- Transmission proof mailed to district sales office.

3- Transmission proof mailed to branch sales office.

4- Plant file copy.

Coincident with development of the procedure, special procedure committees in every plant planned the paper work to the system's specifications, and sought ways to develop better methods in the production control areas as a whole.

Preprinted forms for package identification used at all plants are uniform in arrangement with a section

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of the sales order.

When an order has been made up and charges figured, a new form (the first since the original sales order) is made. From a summary of material to be shipped and a copy of the sales order, a typist writes on an electric typewriter a four-part invoice master, and a shipment manifest consisting of load tally file copy, extra copy, and customer copy. Wording on the invoice is the same as on the sales order, and appears in identical locations.

Every morning each plant prepares tapes, and teletypes a daily shipment list to the sales offices concerned, and a daily report of shipments to Pittsburgh. At Pittsburgh, a tape and three copies of a continuous form are received on the teletypewriter for the use of the production planning division and the accounting department. Tabulating cards may be punched from the tape.

"With this comprehensive information on shipments from every plant being automatically and almost immediately punched into cards for machine accounting purposes--and with comparable records or orders entered--it is clear that the company is in possession of means for a statistical picture of its business which is only hours removed from the events."

"How Lockheed took its first step in data integration," *by H. Warren White, Lockheed Aircraft Corp., Burbank, Calif.*

THE OFFICE, February, 1955; pages 82-84, 163-165.

"Lockheed has taken the first step toward data integration and electronic processing in the field of material control. An electro-mechanical sensing device (intercoupler) for a National posting machine, through which a standard IBM 526 key punch can be operated, was developed ... by Systematics, Inc., Hermosa Beach, California. This makes possible the preparation of a cost distribution and procurement analysis card as a by-product of the posting operation."

The system offers an answer to the problem of the material control field, in which the primary need is in getting information off detailed records. The intercoupler attaches to the back of an NCR 3100 or 3200 posting machine, and operates an IBM 526 key punch. The posted entries which are to appear on the punched cards are set on the posting machine's control bar just as its other operations are set. The cards are punched automatically as the operator uses the posting machine.

The use of the intercoupler makes possible:

1- Integration of material control and general accounting ledgers.

2- Input information for analysis of the material control function by electronic computing.

3- Verification of posting operation by a parallel key punch operation.

4- Maintenance of a detailed ledger for random extraction.

5- Probable savings in speed and accuracy, and future possibilities of use of the data.

In beginning to think of automatic data processing, Lockheed recognizes several facts: 1) necessity for accuracy of input data to achieve accurate output; 2) the necessity for clerical management to learn their basic functions and to state the problem so that others can understand.

"Automatic processing of orders and invoices," *by Frank D. Hirschman, Morris Paper Mills, Morris, Illinois.*

N.A.C.A. BULLETIN, April, 1955; pages 1077-1083.

Morris Paper Mills' old method of handling a sales order form and mailing it to any of three mills, had a number of disadvantages which led them to consider a new common-language approach. The goal was to write an order in such a way that the static information would fall into position to form an invoice. However, since as many as 16 copies were needed, the real problem seemed to be how to get the sales order from the sales office to the plant without duplication of form preparation.

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After some study, it seemed that the automatic typewriter, used with the teletype, offered the answers, for these reasons: 1) all orders could be typed in the sales offices, audited for accuracy, then transmitted to the plant via teletype, using the punched tape produced by the typewriter; 2) faster transmission could be had from using the tape rather than keyboard operation. Thus, a master tape carries all the pertinent data on an order which would be constant for and unique to a particular customer. Only the items for the new order for that customer need be changed. Verifying time is saved and accuracy assured; also, the tape provides accessible storage of data for later statistical analysis, and other uses. Before the system was begun, 1600 master tapes for one regular customer alone were prepared and filed.

At the sales office, orders are typed on the automatic typewriter, which produces a five-channel punched tape. The master tapes are used to type in the constant data. The new order tape is filed with a copy of the typed order. After checking, the order is transmitted by teletype to the plant. When the order is shipped from stock, a new shipping copy is written by the stock clerk, which is routed to the billing department, and matched with the billing copy. Calculators are then used to make price extensions from the information on the billing and shipping copies. It is anticipated that an automatic typewriter-calculator combination will be used eventually. The results would then be printed directly on the billing master (for duplicator printing) with the automatic typewriter creating a punched tape for analysis purposes.

"Univac cuts account expense"

BANKING, May, 1955; page 104

The Western Saving Fund Society of Philadelphia is preparing to use a Univac 120 for savings and mortgage accounting. The new system is expected to reduce accounting costs and to speed up all of the bank's accounting operations. Also, it will speed up availability of information for the bank's management. In the mortgage application, the amount of the payment is automatically punched on a tape at the teller's window. The tape then feeds the data to a card-punch machine. The cards are then automatically listed to balance with the mortgage receipts for the day, and are collated with cards showing prior balances. Prior balance cards and current transaction cards are processed simultaneously through Univac, which automatically picks up the unpaid mortgage balances, calculates breakdown of the payments as to interest, principal and escrow, computes the new balances and records them on new balance cards. The new balance cards then go through an automatic "line finding poster interpreter," which posts them to the mortgage ledger cards.

In the savings account application, the account number and the amount of the deposit or withdrawal are manually punched on a transaction card from which the posting is made automatically to a ledger card. The system will take into consideration deviations such as late charges, prepayments, etc. The computing system can check its own computations.

"Electronic reservation system for New Haven"

RAILWAY AGE, April 4, 1955; pages 15, 16.

The New Haven Railroad has ordered from Teleregister Corporation a "Magnetronic Reservisor System," capable of handling up to 1000 space reservations per hour. System covers passenger reservation desks in New York, Boston, New Haven, Hartford, and Providence.

"Heart of the system is a magnetic drum, located at Stamford, capable of storing data on availability, reservation, and sale of approximately 100,000 individual space accommodations during a 31-day period. As space is reserved or sold, the inventory on the memory drum is changed accordingly by a central electronic computer. If a reservation is cancelled, re-availability of the space is recorded immediately on the drum and the accommodation becomes available for resale. If the cancellation involves space on a train for which there is a waiting list, the 'Reservisor' routes this information to a special clerk who will assign the newly available space to the first passenger on the list."

"Electronic processing of air-traffic control information"

ELECTRICAL ENGINEERING, May, 1955; pages 374-377.

A condensation of the AIEE Transactions Paper titled, "An Electronic System for Processing Air-Traffic-Control Information." (See DPD, April, 1955; page 7.)

"What's new in pipeline electronics?"

OIL AND GAS JOURNAL, February 7, 1955; pages 92-95.

Remote operation and fast response to small signals are two cases where the use of digital electronic equipment is justified in the pipeline industry, and more uses will be found in the areas formerly controlled by hydraulics and mechanics.

Systems Analysis

"Methods planning – when, where, how?"

by Ralph W. Fairbanks, Management Consultant.

OFFICE MANAGEMENT, Part I, February, 1955; pages 16-19.

Part II, March, 1955; pages 30, 66-68.

There are two necessary steps in planning overall systems revisions within an office: 1) basic analysis of the division, what management requires of it, what functions it must fill in order to meet management demands; and 2) a program of overall system refinement.

The techniques in developing a program of system refinement are 1) systems development in methods and equipment, and 2) personnel controls.

The ideal systems improvement program should offer a substantial savings in clerical overhead and equipment costs, and simultaneously achieve faster processing of daily work, increased accuracy, and greater system flexibility.

If estimated potential savings are greater than equipment and installation costs, annual recurring costs, plus costs of converting to the new procedure, training personnel for it, and cost of all other related factors--time needed for conversion, effect on customer service, and future development in new machines which may make the procedure obsolete within a given time--then the procedure change should be made. The systems innovation must take into consideration possible conversion to electronic equipment.

((The remainder of the article is devoted to personnel selection.))

Part II (March issue) discusses the responsibility for the methods planning function, and the qualities of a good methods analyst. Research into function and place of a methods department showed it was best established as a staff position directly responsible to management.

"Preparation and use of process and flow charts,"

by W. Gerald Cole, Bethlehem Steel Co.

N.A.C.A. BULLETIN, April, 1955; pages 1084-1094

Flow charts may be drawn easily and simply to aid in the analysis of a clerical or operational procedure, in the planning of an integrated data processing system. The more complicated the operation to be analyzed the more important it is to have a visual representation. Sometimes the process of preparing a chart will show up discrepancies not noticeable before.

Uniformity of charts in the company makes them easily read and understood by every department. Some rules for good charting are:

1- Standardize symbols and definitions so they will be understood by all departments.

2- Keep them simple. Use only one charting method on a single sheet, and confine it to a single purpose.

3- Include complete identification of subject matter, persons involved, dates, charting code, etc.

Types of charts illustrated and described are:

1- Process charts. The example illustrates a clerical procedure, with symbols representing operations, transportations, inspections, and storages.

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2- Work flow charts. The example shows the main actions and interunit flow in the sequence of operations of clerical procedures.

3- Record flow charts. The example shows the distribution of copies of a multi-copy form.

4- Layout flow chart. The example shows the flow of paper work on a floor plan of an office. This chart is used for analyzing equipment and furniture layout.

5- Special purpose flow charts include charts for planning punched card procedures, or other specific clerical/or mechanical procedures.

"Preparing for electronics"

THE CONTROLLER, May, 1955; pages 226, 227.

At the Southern Regional Conference of The Controllers' Institute, Luther Harr of Remington Rand, discussing the steps a company must take before ordering an electronic computer, said, "The first step in a sound program is for a company to accept the fact that no manufacturer of computing equipment can recommend whether a company should or should not procure a computer. The prospective user must bear the major burden of determining whether economies will result from installing an electronic computing system... It appears that even greater economic rewards will result from applying electronic computer methods to fields virtually untouched today by conventional equipment. Such fields include operations research and scientific management...The only real advantage [in going from manual to punched card, and then to electronic techniques] is that generally the installation of tabulating equipment results in fairly detailed and specific procedure manuals which are of considerable value in both the evaluation and installation of large-scale electronic equipment. Remember, approximately 70 to 80 percent of the undertaking is defining the problem to be solved."

Management Decision-making Techniques

"Operations research and management problems,"

by Wroe Alderson, visiting professor, M.I.T.

ADVANCED MANAGEMENT, April, 1955; pages 14-17

"A problem for the operations researcher is a question concerning efficiency or productivity in some operating system. An acceptable solution takes the form of a rule of action for getting the best results." The effect of operations research is to remove uncertainty in making a decision. There are at least four levels which can be distinguished in characterizing management problems.

At the lowest level of decision-making, management is assumed to be dealing with a well-oiled machine and the problem is to determine the most profitable allocation of effort (for example, in dividing promotional effort between advertising, promotion and direct selling to maximize sales-per-dollar; or in the allocation of materials to various warehouses to minimize transportation costs while meeting the demand). The problems of decision here are complicated by the number of choices to be made. Linear programming is one of the techniques used to solve these allocation problems.

At the next level we assume that the system is composed of semi-independent groups susceptible to management. The problem is the coordination and control of these groups. To accomplish this the proper information must be made available and interpreted. Control system theory, information theory, and waiting line theory are used to solve this level of problems. The coordination of maintenance personnel in servicing equipment is a typical case. If we drop the assumption that management is dealing with a closed system (that is, we no longer assume that complete information is available) we reach the third level, that of information and contact. Here we come to the problem of the supplier searching for customers; or the problems of consumer shopping behavior. Probability models can be used at this level to increase the information available and the likelihood of contact.

Finally, at the fourth level, the reality of conflicting interests is recognized and we come to the problems of competitive strategy and value theory. Although there is no substitute for managerial experience and resourcefulness in devising or meeting competition, an orderly frame for evaluating possibilities is useful. The theory of games is a mathematical technique for providing such a frame. Also the resolution of conflict by appeal to a high level (e.g., long-range plans) is effective.

Equipment

"Electronic charge accounts"

AUTOMATIC CONTROL, April, 1955; page 25.

A new electronic system, "Scandex," will soon be used by a major oil company. Scandex "reads" tabulating card invoices imprinted at the point of sale with data from customer credit card identification. The system verifies the accuracy of the account number, then automatically key punches the scanned data into the original invoice card. It also can be operated with an adding machine to key punch the dollar amount of sale.

The photo-electric cell picks up a small spot of light reflected from the card as it moves past the reading station. Pulses produced by the photocell scanner are analyzed by a small, special purpose digital computer, which recognizes characters and stores them as pulse patterns. They are read out of storage by the key punch control circuits.

Farrington Manufacturing Company of Boston, which produces Scandex, will rent the equipment for $1000 per month, including service and maintenance. Farrington figures this to be a potential savings of $1000 per month per million invoices. They believe this to be the first time that the original imprinted invoice card can be processed automatically from point-of-sale through accounting procedures.

"Control components provide new ways to handle materials"

AUTOMATIC CONTROL, May, 1955; pages 28, 29.

The Kidde Warehousing System, designed by Walter Kidde Constructors and Teleregister Corporation has been built as a prototype at the Link-Belt Company. Incoming orders are broken down by items requested. A separate card is punched for every item on every order, along with customer's name, address, number. Customer's number is assigned to an individual collecting station in warehouse. Order clerks arrange cards according to location of items in stock racks, and hand cards over to pickers. (This operation could be done by an electronic sorting machine.) Picker collects items for many customer orders as he comes to them, and places each item, along with its card in a travelling overhead tray. Dispatcher takes card from each tray, places it in electronic card reader which punches its information onto paper tape. Tape directs tray to unload at chute corresponding to customer's number, and package slides down to proper collecting station. When all of customer's packages are collected a signal tells packer to unload order.

Kidde engineers estimate the system can double productivity of warehouse personnel while reducing warehouse space up to 25%.

(See also FACTORY MANAGEMENT AND MAINTENANCE, May, 1955; pages 98, 99: "Tomorrow's warehouse is here today.")

"Speed up data handling with input-output devices,"

by Graham Smith, Remington Rand, Inc.

AUTOMATIC CONTROL, April, 1955; pages 14, 15.

Where analog data is to be fed into a digital system, especially for real-time applications, custom engineering is generally required. Some standard shaft-position to digital converters are available. Several high speed printing devices in the ranges 800-900 lines per minute are available now for output from electronic computers; but future equipment will operate at speeds closer to those of the computers, which produce at the rate of 2000-2500 lines per minute. Cathode ray tube printers (Remington Rand and Convair) are becoming available.

"Photoelectric reader feeds business machines"

ELECTRONICS, May, 1955, pages 134-138.

A technical description of the analyzing reader designed by Intelligent Machines Research Corporation. (See DPD, May, 1955; page 8.)

Business Data Processing–A Review

Part I – Why Process Data?

There are three basic reasons in any business for the processing of data:

1- To provide information for proper management control.

2- To meet accounting, legal and tax requirements.

3- To allow the issuing of orders.

Although reason 2 is the traditional basis for data-processing in business, number 1--the need for data to control the business--is the most pressing and puts the severest requirements on any data processing system. A business is like an automobile. It is not enough to pour gasoline in the tank and get power at the wheels; a driver is needed to control the process. So it is not enough to put money, materials and manpower into a business and get a product out--managers are required to insure profits. But a driver who does not (or cannot) watch the road is of little value. So a management which does not know the status of its business in time or in proper perspective cannot control the business to insure profits. The data processing system must provide:

the data management requires
in time to be of use
summarized and presented in the proper way.

(Deciding what reports are required and the best method of presenting them is an area covered by Operations Research.)

Typical management reports include performance vs budget reports, sales statistics, direct and overhead cost figures, and the basic report: profit statement.

The data processing system must, of course, provide all of the reports required by governmental agencies; it must provide data for preparing tax returns; and provide the checks and associated journals for meeting payrolls and paying vendors. Often the data required for management control purposes can be obtained as a "by-product" of the processing necessary to meet these legal and accounting requirements. The management control data is certainly not a "by-product" in the functional sense--it is an indispensable part of running the business.

Since modern data-processing equipment is capable of performing a number of complicated calculations and of making simple comparisons and decisions, it is possible to allow the data-processing system itself to issue some of the routine orders required to run the business. Data processing systems can be programmed --that is, set up--to decide when to reorder items to maintain an inventory, and can issue the necessary shop or purchase order forms to accomplish the ordering. The same functions can be and often are performed in manual data-processing systems also; that is, the decisions about when to reorder routine items are left to clerks. Of course, management still sets the basic policies which guide the decisions whether made by clerks or by machine.

It is interesting to note that a data processing organization is not unlike a manufacturing firm: it has raw data as its raw material. This data is modified and processed by the application of man- and machine-power. Finally the product emerges: reports, orders, and accounting journals. It seems reasonable that this data processing organization can be managed just like any other, using all of the management techniques available: incentive plans, budgeting techniques, careful scheduling, and the utilization of high-productivity automatic equipment.

Whether manual, card, or electronic, a properly run data processing system must provide in the most economical manner:

proper data for legal, accounting and tax purposes

timely and proper data for management, for control of the business

and often, properly issued routine orders.

(Part II will appear in the July issue of DPD.)

Seminars, Meetings

University of Michigan course on computers -- Aug. 1 through 12, 1955. Cost: $160.00 plus lodging. Write to: Dr. John W. Carr, Willow Run Research Center, University of Michigan, Ypsilanti, Michigan.

Operations Research Society of America national meeting, Aug. 15-17, Hotel Statler, Los Angeles. Program Chairman: Robert A. Bailey, Lockheed Aircraft Corp., Burbank, Calif.

"Electronics and Automatic Production," symposium sponsored by National Industrial Conference and Stanford Research Institute; Aug. 22, 23, San Francisco.

Instrument Society Computer Clinic, Sept. 14-16, Los Angeles.

Association for Computing Machinery, Sept. 14-16, University of Pennsylvania.

Controller' Institute, Nov. 7-9, Statler Hotel, Los Angeles.

Electronics Business Systems Conference, Nov. 10, 11, Statler Hotel, Los Angeles (NMAA).

Comment

EDUCATION

Following the publication of the first issue of DPD in April, a number of inquiries were received asking about the availability of "tutorial" literature--a beginner's handbook on data processing. A fast moving field such as electronic data processing is bound to raise a need for more educational literature at the introductory level.

Unfortunately, the amount of good introductory literature so far is very limited. However, several suggestions might be made for those persons interested in learning about the field:

1- There are two or three popularly written books which help to acquaint people entering the field with some of the objectives and methods (e.g. Giant Brains, Wiley, 1949; Automation, Van Nostrand, 1952).

2- The American Management Association has done a particularly good job of presenting meaty conferences on this subject. The conferences are aimed at management's interest; some of the reports have been abstracted in DPD. Conferences by other societies have been good also, and will be reported in DPD.

3- Several summer courses are being presented, such as those at Wayne University in June and at University of Michigan in August (notices in May and June issues of DPD). Regular term courses are offered at several universities, including NYU, UCLA, USC, and Temple. Notices of such courses will be made in DPD whenever possible.

4- Computer manufacturers, such as IBM, Remington Rand, Underwood, and ElectroData, offer short executive-type courses on computers as well as longer programming courses, for business applications.

5- The first technical books aimed at the data processing field will begin appearing this summer and fall. Several leading publishers now have books well along toward publication. Such books will be reviewed by DPD upon publication.

6- DPD, through its "Business Data Processing--A Review," will describe some of the important principles of the field, over a period of months.

SIGNIFICANT DEVELOPMENTS

This month, the articles about the C. & O. Railroad, Alcoa, Morris Paper Mills, and Lockheed (pages 2, 5, 6, and 7) illustrate one important aspect of integrated data processing -- recording data only once and obtaining a machine-language version of the data as a by-product, for subsequent processing. Because this type of equipment is available, this is one of the first data processing areas to reach rather wide-spread application.

The new Scandex equipment (page 12) promises to extend this area even farther--right to the point of transaction--for certain types of data processing. The equipment apparently includes an important redundancy checking technique. (Redundancy check is a general term used to describe any method of automatic self-checking by a data processing device.)

The Kidde warehouse system (page 12) is an interesting prototype of important systems to come. It is an initial example of the relationship between automatic data processing (punched cards, in this particular case) and automation (automatic materials handling and machine control).

The article on Operations Research (page 11) has done very well in pointing out four different levels of management problems in which Operations Research can be of aid.

References noted in this issue

Advanced Management
74 Fifth Avenue
New York 11, New York

American Management Association
330 West 42nd Street
New York 36, New York

Automatic Control
430 Park Avenue
New York 22, New York

Automation
Penton Building
Cleveland 13, Ohio

Banking
12 East 36th Street
New York 16, New York

The Controller
1 East 42nd Street
New York 17, New York

Electrical Engineering
500 Fifth Avenue, Suites 7 & 8
New York 36, New York

Electronics
330 West 42nd Street
New York 36, New York

Factory Management & Maintenance
330 West 42nd Street
New York 36, New York

Journal of Society for Industrial and Applied Mathematics
Box 7541
Philadelphia, Pennsylvania

Management Methods
141 East 44th Street
New York 17, New York

N.A.C.A. Bulletin
505 Park Avenue
New York 22, New York

The Office
232 Madison Avenue
New York 16, New York

Office Management
212 Fifth Avenue
New York 10, New York

Oil and Gas Journal
211 South Cheyenne Avenue
Tulsa 1, Oklahoma

Railway Age
30 Church Street
New York 7, New York

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